General

Title

Overuse of imaging: percentage of children, ages 1 through 17 years old, for whom CT imaging of the head is obtained for the evaluation of a first generalized afebrile, atraumatic seizure without indication for CT imaging.

Source(s)

Quality Measurement, Evaluation, Testing, Review and Implementation Consortium (Q-METRIC). Basic measure information: overuse of computed tomography scans for the evaluation of children with a first generalized afebrile, atraumatic seizure. Ann Arbor (MI): Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium (Q-METRIC); 2016 Jan. 66 p.

Measure Domain

Primary Measure Domain

Clinical Quality Measures: Process

Secondary Measure Domain

Does not apply to this measure

Brief Abstract

Description

This measure is used to assess the percentage of children, ages 1 through 17 years old, for whom computed tomography (CT) imaging of the head is obtained for the evaluation of a first generalized afebrile, atraumatic seizure without indication for CT imaging.

A lower percentage indicates better performance, as reflected by avoiding CT imaging when it is not indicated.

Rationale

Seizures are common; every year, it is anticipated that up to 40,000 children in the United States will experience a first afebrile seizure (Hirtz et al., 2000). Neuroimaging is used in pediatric patients who

have experienced a seizure to evaluate for structural brain abnormalities that may require surgical intervention or predispose to future seizures. Clinical guidelines maintain that children who present for evaluation after a first, generalized, afebrile seizure and meet low-risk criteria can be safely discharged without emergent neuroimaging, if follow-up can be assured (Gaillard et al., 2009; Hirtz et al., 2000). While widely available, computed tomography (CT) imaging for the evaluation of seizure in children has inferior resolution compared with magnetic resonance imaging (MRI) (Gaillard et al., 2009; Hirtz et al., 2000) and is generally low-yield (Aprahamian et al., 2014; Garvey et al., 1998; Maytal et al., 2000; Sharma et al., 2003; Warden, Brownstein, & Del Beccaro, 1997), suggesting overuse of this imaging modality.

This measure will address the overuse of CT of the brain among children evaluated for a first, afebrile seizure who return to neurologic baseline after the event. Overuse has been defined as any patient who undergoes a procedure or test for an inappropriate indication (Lawson et al., 2012). Imaging overuse subjects children to a number of risks (Malviya et al., 2000; Mathews et al., 2013; Pearce et al., 2012; Wachtel, Dexter, & Dow, 2009). Children who undergo CT scans in early childhood tend to be at greater risk for developing leukemia, primary brain tumors, and other malignancies later in life (Mathews et al., 2013; Pearce et al., 2012). Children are also at risk for complications from sedation or anesthesia, which are often required for longer CT imaging sequences. These complications include compromised airway, hypoxia leading to central nervous system injury, and death. Additionally, CT overuse when a follow-up MRI study will be necessary creates cost burdens for the patient, as well as for payers.

Evidence for Rationale

Aprahamian N, Harper MB, Prabhu SP, Monuteaux MC, Sadiq Z, Torres A, Kimia AA. Pediatric first time non-febrile seizure with focal manifestations: is emergent imaging indicated?. Seizure. 2014 Oct;23(9):740-5. PubMed

Gaillard WD, Chiron C, Cross JH, Harvey AS, Kuzniecky R, Hertz-Pannier L, Vezina LG, ILAE, Committee for Neuroimaging, Subcommittee for Pediatric. Guidelines for imaging infants and children with recent-onset epilepsy. Epilepsia. 2009 Sep;50(9):2147-53. PubMed

Garvey MA, Gaillard WD, Rusin JA, Ochsenschlager D, Weinstein S, Conry JA, Winkfield DR, Vezina LG. Emergency brain computed tomography in children with seizures: who is most likely to benefit?. J Pediatr. 1998 Nov;133(5):664-9. PubMed

Hirtz D, Ashwal S, Berg A, Bettis D, Camfield C, Camfield P, Crumrine P, Elterman R, Schneider S, Shinnar S. Practice parameter: evaluating a first nonfebrile seizure in children: report of the quality standards subcommittee of the American Academy of Neurology, The Child Neurology Society, and The American Epilepsy Society. Neurology. 2000 Sep 12;55(5):616-23. PubMed

Lawson EH, Gibbons MM, Ko CY, Shekelle PG. The appropriateness method has acceptable reliability and validity for assessing overuse and underuse of surgical procedures. J Clin Epidemiol. 2012 Nov;65(11):1133-43. PubMed

Malviya S, Voepel-Lewis T, Eldevik OP, Rockwell DT, Wong JH, Tait AR. Sedation and general anaesthesia in children undergoing MRI and CT: adverse events and outcomes. Br J Anaesth. 2000 Jun;84(6):743-8. PubMed

Mathews JD, Forsythe AV, Brady Z, Butler MW, Goergen SK, Byrnes GB, Giles GG, Wallace AB, Anderson PR, Guiver TA, McGale P, Cain TM, Dowty JG, Bickerstaffe AC, Darby SC. Cancer risk in 680,000 people exposed to computed tomography scans in childhood or adolescence: data linkage study of 11 million Australians. BMJ. 2013;346:f2360. PubMed

Maytal J, Krauss JM, Novak G, Nagelberg J, Patel M. The role of brain computed tomography in

evaluating children with new onset of seizures in the emergency department. Epilepsia. 2000 AUG;41(8):950-4.

Pearce MS, Salotti JA, Little MP, McHugh K, Lee C, Kim KP, Howe NL, Ronckers CM, Rajaraman P, Sir Craft AW, Parker L, Berrington de GonzÃilez A. Radiation exposure from CT scans in childhood and subsequent risk of leukaemia and brain tumours: a retrospective cohort study. Lancet. 2012 Aug 4;380(9840):499-505. PubMed

Quality Measurement, Evaluation, Testing, Review and Implementation Consortium (Q-METRIC). Basic measure information: overuse of computed tomography scans for the evaluation of children with a first generalized afebrile, atraumatic seizure. Ann Arbor (MI): Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium (Q-METRIC); 2016 Jan. 66 p.

Sharma S, Riviello JJ, Harper MB, Baskin MN. The role of emergent neuroimaging in children with new-onset afebrile seizures. Pediatrics. 2003 Jan;111(1):1-5. PubMed

Wachtel RE, Dexter F, Dow AJ. Growth rates in pediatric diagnostic imaging and sedation. Anesth Analg. 2009 May;108(5):1616-21. PubMed

Warden CR, Brownstein DR, Del Beccaro MA. Predictors of abnormal findings of computed tomography of the head in pediatric patients presenting with seizures. Ann Emerg Med. 1997 Apr;29(4):518-23. PubMed

Primary Health Components

Afebrile, atraumatic seizure; computed tomography (CT); overuse; children

Denominator Description

The denominator is the number of children, ages 1 through 17 years old, for whom computed tomography (CT) imaging of the head is obtained for the evaluation of a first generalized afebrile, atraumatic seizure. See the related "Denominator Inclusions/Exclusions" field.

Numerator Description

The numerator is the number of children, ages 1 through 17 years old, for whom computed tomography (CT) imaging of the head is obtained for the evaluation of a first generalized afebrile, atraumatic seizure without indication for CT imaging. See the related "Numerator Inclusions/Exclusions" field.

Evidence Supporting the Measure

Type of Evidence Supporting the Criterion of Quality for the Measure

A clinical practice guideline or other peer-reviewed synthesis of the clinical research evidence

A formal consensus procedure, involving experts in relevant clinical, methodological, public health and organizational sciences

A systematic review of the clinical research literature (e.g., Cochrane Review)

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

Additional Information Supporting Need for the Measure

Afebrile, Atraumatic Seizures: Prevalence and Incidence
The American Academy of Neurology (AAN) "Practice Parameter: Evaluating a First Nonfebrile Seizure in Children" estimates that annually, between 25,000 and 40,000 children in the United States experience a first nonfebrile seizure (Hirtz et al., 2000; Hirtz et al., 2003). Seizures account for roughly 2% of visits to emergency departments at children's hospitals (Martindale, Goldstein, & Pallin, 2011).

Afebrile, Atraumatic Seizure Pathology and Severity
In general, a seizure will involve abnormal movements or changes in behavior that occur as a result of uncontrolled electrical activity in the brain (Duvivier & Pollack, 2009). A generalized seizure is associated with altered consciousness because abnormal electrical activity involves all or large parts of the brain. The expected overall recurrence rate after a first unprovoked seizure is around 50%, with a minority of children going on to experience multiple recurrent seizures (Hirtz et al., 2003).

Burdens of Overuse of Imaging in Afebrile, Atraumatic Seizures
The literature offers many examples of the potential risks associated with overuse of imaging. Chief among these are risks related to radiation (Mathews et al., 2013; Pearce et al., 2012), sedation and/or anesthesia (Malviya et al., 2000; Wachtel, Dexter, & Dow, 2009), and intravenous contrast media (Zo'o et al., 2011). Cost is also an issue.

Radiation-Related Burden and Risk. Radiation exposure associated with computed tomography (CT)-imaging introduces the possibility of chronic health risks related to malignancies sustained from radiation effects (Berrington de González et al., 2009; Mathews et al., 2013; Pearce et al., 2012). Radiosensitive organs—including the brain, bone marrow, lens of the eye, and thyroid gland—can be exposed to radiation during CT of the head (Papadakis et al., 2011). In children younger than 5 years of age, about 20% of the active bone marrow is in the cranium, compared with 8% in adults (Cristy, 1981). CT-based radiation dose for pediatric patients is highly problematic because developing cellular structures and tissues of children are significantly more radiosensitive than those of adults; children, therefore, will be at substantially elevated risk for malignancy (Hayes et al., 2012).

To conduct imaging studies with radiation dosing that is appropriate for children, many facilities follow policies and protocols using the concept of ALARA —As Low As Reasonably Achievable. ALARA principles deem any additional radiation beyond the minimum needed for interpretable images both detrimental and non-efficacious (American College of Radiology [ACR], 2009). Professional practice and patient advocacy groups, including the ACR, the AAN, and the American Academy of Pediatrics (AAP), have developed and promoted ALARA protocols and policies; these guidelines support the use of CT imaging only when clinically indicated in children, decreasing the risk of harm from radiation.

Sedation and Anesthesia-Related Burden and Risk. Some children will require sedation to ensure minimal movement during CT studies. Use of sedation is necessary to avoid motion artifacts, which invariably occur if the child moves during image acquisition, thus interfering with image quality. Motion artifacts sometimes undermine imaging quality to the point of rendering images unreadable. In the case of CT imaging, this may result in additional radiation exposure to obtain images sufficient for interpretation. Although the sedation used for pediatric imaging has been identified as low risk, it does have potential attendant complications (Cravero et al., 2006; Malviya et al., 2000). Levels of sedation are on a continuum from minimal anxiolysis (administration of an anxiety reduction agent) to deep sedation, in which the patient can be roused only via vigorous stimuli (Arthurs & Sury, 2013). Compared with minimal sedation, moderate and deep sedation carry a greater risk of airway compromise, hypoxia resulting in central nervous system injury, and death (Cravero et al., 2006).

In certain instances, sedation may not be sufficient, and anesthesia will be required to complete imaging. Anesthesia includes administration of medication to the extent that there is some degree of respiratory suppression and potential for cardiac depression; the patient cannot be roused by external stimuli or commands (Arthurs & Sury, 2013). Administration of anesthesia raises risks related to the process of intubation for respiratory support. These risks include dental trauma; airway edema (swelling of the windpipe); vocal cord spasm or injury; regurgitation of stomach contents with subsequent aspiration

(inhalation) pneumonia; injury to arteries, veins, or nerves; alterations in blood pressure; and/or irregular heart rhythms (Society for Pediatric Anesthesia, 2014). The most severe risks, though rare, include brain damage and death (Society for Pediatric Anesthesia, 2014).

Intravenous Contrast-Related Burden and Risk. During the course of CT and magnetic resonance imaging (MRI) studies, intravenous (IV) contrast media may be used to enhance visualization of vascular structures and provide important information about neurologic anatomy. It is possible a child may experience an allergic reaction to IV contrast or subcutaneous fluid leakage (extravasation) during administration of IV contrast. IV contrast administration also includes the risk of contrast-induced nephrotoxicity (CIN) (Bansal et al., 2014; Zo'o et al., 2011). Children with poor kidney function are at greater risk for developing CIN and, in rare cases, will develop renal failure requiring dialysis.

Cost-Related Burden. Overuse of imaging is costly and places additional strain on an already heavily burdened health care system (Callaghan et al., 2014). As an example, charges for a CT of the brain can be as much as $2,000 and can vary substantially by region of the country. In addition, the likelihood that neuroimaging will result in the identification of clinically important structural abnormalities in this patient population is low. Incidental findings, however, may require follow-up testing with associated charges and potential complications (Lumbreras, Donat, & Hernández-Aguado, 2010; Rogers et al., 2013).

Performance Gap

The low yield of neuroimaging studies in children with seizure presenting to emergency departments has been documented repeatedly (Warden, Brownstein, & Del Beccaro, 1997; Garvey et al., 1998; Hirtz et al., 2000; Maytal et al., 2000; Gaillard et al., 2009; Aprahamian et al., 2014). The AAN, the International League Against Epilepsy (ILAE), and the ACR generally favor MRI over CT for the evaluation of children who require neuroimaging after a first afebrile seizure, due to the superior resolution and lack of radiation associated with MRI (Hirtz et al., 2000; Gaillard et al., 2009; Dory et al., 2012). The AAN and ILAE also provide guidance on specific features of childhood seizures that increase or decrease the likely benefit of obtaining neuroimaging studies at all (Gaillard et al., 2009; Hirtz et al., 2000).

Drivers of Overuse

Seizures can be stressful events that may prompt a parent to seek the assistance of a health care provider, at times emergently. A seizure generates considerable distress and concern for family members and caregivers who witness it (Shinnar & Pellock, 2002; Baumer et al., 1981). Some providers may feel pressured by the parent to order imaging despite a lack of benefit (Dory et al., 2012). This circumstance has a close parallel with parents who seek antibiotics for a child who has viral respiratory symptoms. In these circumstances, the provider may deviate from established practice guidelines to placate the parent. In recent decades, this phenomenon has reached such wide-spread prominence as to prompt multidisciplinary initiatives targeted at fostering discussion and identifying common practices that should be questioned by parents and providers (AAP, 2013). An ongoing dialogue between providers and parents about the risks and benefits of CT imaging continues to be a key feature of minimizing overuse in the setting of seizures.

The practice of defensive medicine is another reason an imaging study may be ordered. Physicians may be uncomfortable facing uncertainty regarding the etiology of seizure in children they are evaluating and treating. Assurance behaviors (e.g., ordering additional tests) are expected when a malpractice-sensitive physician is faced with a potentially worrisome condition that can cause the symptom in question (Carrier et al., 2013). In a survey of physicians from six specialties at high risk of liability, emergency physicians ordered more unnecessary diagnostic tests than clinicians from any other specialty (Studdert, et al. 2005). Physicians practicing in the emergency department have the added challenge of limited access to detailed medical records, which increases uncertainty about prior evaluation of patients who are referred from an out-of-network provider or hospital. Overuse of neuroimaging is a potential result.

See the original measure documentation for additional evidence supporting the measure.

Evidence for Additional Information Supporting Need for the Measure

American Academy of Pediatrics (AAP). Choosing Wisely: An initiative of the ABIM Foundation. Ten things physicians and patients should question. [internet]. Philadelphia (PA): American Academy of Pediatrics (AAP); 2013 Feb 21 [accessed 2015 Feb 24].

American College of Radiology (ACR). Statement on recent studies regarding CT scans and increased cancer risk. [internet]. Reston (VA): American College of Radiology (ACR); 2009 Dec 15 [accessed 2015 Jul 14].

Aprahamian N, Harper MB, Prabhu SP, Monuteaux MC, Sadiq Z, Torres A, Kimia AA. Pediatric first time non-febrile seizure with focal manifestations: is emergent imaging indicated?. Seizure. 2014 Oct;23(9):740-5. PubMed

Arthurs OJ, Sury M. Anaesthesia or sedation for paediatric MRI: advantages and disadvantages. Curr Opin Anaesthesiol. 2013 Aug;26(4):489-94. PubMed

Bansal R. Contrast-induced nephropathy. In: Medscape Drugs & Diseases [internet]. New York (NY): WebMD LLC; 2014 [accessed 2015 Apr 20].

Baumer JH, David TJ, Valentine SJ, Roberts JE, Hughes BR. Many parents think their child is dying when having a first febrile convulsion. Dev Med Child Neurol. 1981 Aug;23(4):462-4. PubMed

Berrington de Gonzalez A, Mahesh M, Kim KP, Bhargavan M, Lewis R, Mettler F, Land C. Projected cancer risks from computed tomographic scans performed in the United States in 2007. Arch Intern Med. 2009 Dec 14;169(22):2071-7. PubMed

Callaghan BC, Kerber KA, Pace RJ, Skolarus LE, Burke JF. Headaches and neuroimaging: high utilization and costs despite guidelines. JAMA Intern Med. 2014 May;174(5):819-21. PubMed

Carrier ER, Reschovsky JD, Katz DA, Mello MM. High physician concern about malpractice risk predicts more aggressive diagnostic testing in office-based practice. Health Aff (Millwood). 2013 Aug;32(8):1383-91. PubMed

Cravero JP, Blike GT, Beach M, Gallagher SM, Hertzog JH, Havidich JE, Gelman B, Pediatric Sedation Research Consortium. Incidence and nature of adverse events during pediatric sedation/anesthesia for procedures outside the operating room: report from the Pediatric Sedation Research Consortium. Pediatrics. 2006 Sep;118(3):1087-96. PubMed

Cristy M. Active bone marrow distribution as a function of age in humans. Phys Med Biol. 1981 May;26(3):389-400. PubMed

Dory CE, Coley BD, Karmazyn B, Charron M, Dempsey ME, Dillman JR, Garber M, Hayes LL, Holloway K, Milla SS, Raske ME, Rice HE, Rigsby CK, Rosenow JM, Strouse PJ, Westra SJ, Wootton-Gorges SL, Expert Panel on Pediatric Imaging. ACR Appropriateness CriteriaÂ® seizures -- child. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 9 p. [41 references]

Duvivier EH, Pollack CV Jr. Chapter 100: Seizures. In: Marx JA, editor(s). Rosenâ€™s Emergency Medicine: Concepts and Clinical Practice. 7th ed. Philadelphia (PA): Mosby Elsevier; 2009.

Gaillard WD, Chiron C, Cross JH, Harvey AS, Kuzniecky R, Hertz-Pannier L, Vezina LG, ILAE, Committee for Neuroimaging, Subcommittee for Pediatric. Guidelines for imaging infants and children with recent-onset epilepsy. Epilepsia. 2009 Sep;50(9):2147-53. PubMed

Garvey MA, Gaillard WD, Rusin JA, Ochsenschlager D, Weinstein S, Conry JA, Winkfield DR, Vezina LG.

Emergency brain computed tomography in children with seizures: who is most likely to benefit?. J Pediatr. 1998 Nov;133(5):664-9. PubMed

Hayes LL, Coley BD, Karmazyn B, Dempsey-Robertson ME, Dillman JR, Dory CE, Garber M, Keller MS, Kulkarni AV, Meyer JS, Milla SS, Myseros JS, Paidas C, Raske ME, Rigsby CK, Strouse PJ, Wootton-Gorges SL, Expert Panel on Pediatric Imaging. ACR Appropriateness CriteriaÂ® headache - child. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 8 p. [41 references]

Hirtz D, Ashwal S, Berg A, Bettis D, Camfield C, Camfield P, Crumrine P, Elterman R, Schneider S, Shinnar S. Practice parameter: evaluating a first nonfebrile seizure in children: report of the quality standards subcommittee of the American Academy of Neurology, The Child Neurology Society, and The American Epilepsy Society. Neurology. 2000 Sep 12;55(5):616-23. PubMed

Hirtz D, Berg A, Bettis D, Camfield C, Camfield P, Crumrine P, Gaillard WD, Schneider S, Shinnar S. Practice parameter: treatment of the child with a first unprovoked seizure: report of the Quality Standards Subcommittee of the American Academy of Neurology and the Practice Committee of the Child Neurology Society. Neurology. 2003 Jan 28;60(2):166-75. [66 references] PubMed

Lumbreras B, Donat L, HernÃindez-Aguado I. Incidental findings in imaging diagnostic tests: a systematic review. Br J Radiol. 2010 Apr;83(988):276-89. PubMed

Malviya S, Voepel-Lewis T, Eldevik OP, Rockwell DT, Wong JH, Tait AR. Sedation and general anaesthesia in children undergoing MRI and CT: adverse events and outcomes. Br J Anaesth. 2000 Jun;84(6):743-8. PubMed

Martindale JL, Goldstein JN, Pallin DJ. Emergency department seizure epidemiology. Emerg Med Clin North Am. 2011 Feb;29(1):15-27. PubMed

Mathews JD, Forsythe AV, Brady Z, Butler MW, Goergen SK, Byrnes GB, Giles GG, Wallace AB, Anderson PR, Guiver TA, McGale P, Cain TM, Dowty JG, Bickerstaffe AC, Darby SC. Cancer risk in 680,000 people exposed to computed tomography scans in childhood or adolescence: data linkage study of 11 million Australians. BMJ. 2013;346:f2360. PubMed

Maytal J, Krauss JM, Novak G, Nagelberg J, Patel M. The role of brain computed tomography in evaluating children with new onset of seizures in the emergency department. Epilepsia. 2000 AUG;41(8):950-4.

Papadakis AE, Perisinakis K, Oikonomou I, Damilakis J. Automatic exposure control in pediatric and adult computed tomography examinations: can we estimate organ and effective dose from mean MAS reduction?. Invest Radiol. 2011 Oct;46(10):654-62. PubMed

Pearce MS, Salotti JA, Little MP, McHugh K, Lee C, Kim KP, Howe NL, Ronckers CM, Rajaraman P, Sir Craft AW, Parker L, Berrington de GonzÃilez A. Radiation exposure from CT scans in childhood and subsequent risk of leukaemia and brain tumours: a retrospective cohort study. Lancet. 2012 Aug 4;380(9840):499-505. PubMed

Quality Measurement, Evaluation, Testing, Review and Implementation Consortium (Q-METRIC). Basic measure information: overuse of computed tomography scans for the evaluation of children with a first generalized afebrile, atraumatic seizure. Ann Arbor (MI): Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium (Q-METRIC); 2016 Jan. 66 p.

Rogers AJ, Maher CO, Schunk JE, Quayle K, Jacobs E, Lichenstein R, Powell E, Miskin M, Dayan P, Holmes JF, Kuppermann N, Pediatric Emergency Care Applied Research Network. Incidental findings in children with blunt head trauma evaluated with cranial CT scans. Pediatrics. 2013 Aug;132(2):e356-63. PubMed

Shinnar S, Pellock JM. Update on the epidemiology and prognosis of pediatric epilepsy. J Child Neurol. 2002 Jan;17 Suppl 1:S4-17. PubMed

Society for Pediatric Anesthesia. Frequently asked questions: What are the risks of anesthesia?. [internet]. 2014 [accessed 2015 Feb 24].

Studdert DM, Mello MM, Sage WM, DesRoches CM, Peugh J, Zapert K, Brennan TA. Defensive medicine among high-risk specialist physicians in a volatile malpractice environment. JAMA. 2005 Jun 1;293(21):2609-17. PubMed

Wachtel RE, Dexter F, Dow AJ. Growth rates in pediatric diagnostic imaging and sedation. Anesth Analg. 2009 May;108(5):1616-21. PubMed

Warden CR, Brownstein DR, Del Beccaro MA. Predictors of abnormal findings of computed tomography of the head in pediatric patients presenting with seizures. Ann Emerg Med. 1997 Apr;29(4):518-23. PubMed

Zo'o M, Hoermann M, Balassy C, Brunelle F, Azoulay R, Pariente D, Panuel M, Le Dosseur P. Renal safety in pediatric imaging: randomized, double-blind phase IV clinical trial of iobitridol 300 versus iodixanol 270 in multidetector CT. Pediatr Radiol. 2011 Nov;41(11):1393-400. PubMed

Extent of Measure Testing

Reliability

This measure was tested using inter-rater reliability (IRR) of medical record data, as described below.

Abstracted Medical Record Data. Medical record data were obtained through HealthCore, Inc., an independent subsidiary of Anthem, Inc., the largest health benefits company/insurer in the United States. HealthCore owns and operates the HealthCore Integrated Research Database (HIRD), a longitudinal database of medical and pharmacy claims and enrollment information for members from 14 geographically diverse Blue Cross and/or Blue Shield (BCBS) health plans in the Northeast, South, West, and Central regions of the United States, with members living in all 50 states. The HIRD includes automated computerized claims data and enrollment information for approximately 60 million lives with medical enrollment, over 37 million lives with combined medical and pharmacy enrollment information, and 16 million lives with outpatient laboratory data from the BCBS licensed plans.

This measure belongs to the Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium (Q-METRIC) Overuse of Imaging for the Evaluation of Children with Headache or Seizures measures collection. As part of the initial sampling strategy for testing multiple measures in this collection, approximately 2.1 million children, ages 6 months through 17 years old, were identified in the HIRD for the study's 2012 measurement year. Of these, a cohort of children with diagnosis codes for headaches and seizures were identified (57,748). Members who did not have continuous eligibility during the 2011 and 2012 calendar years were excluded, narrowing the group to 36,985. Specifically for this measure, administrative claims were used to identify children, ages 1 through 17 years old, who were diagnosed with a first generalized afebrile, atraumatic seizure (4,385, 11.9%). From this group, 532 children (12.1%) were identified as having computed tomography (CT) imaging. After applying claims denominator exclusions, 296 children (55.6%) remained eligible for medical record review.

Among the children eligible for the denominator based on claims, providers associated with the eligible children's visits were identified; the final sampling population consisted of 218 children (73.6%) who were linked to a provider with available contact information. Once subjects were identified, patient medical records were requested from health care providers; records were sent to a centralized location for data abstraction. To ensure an adequate number of cases to test the feasibility of this measure, a target sample of 200 abstracted charts was set.

Trained medical record abstractors reviewed paper copies of the medical records and entered data collected into a password-protected database. To help ensure consistency of data collection, the medical record abstractors were trained on the study's design and presented with a standardized data collection form designed to minimize the need to make subjective judgments during the abstraction process. In addition, data were entered onto forms, which were subsequently scanned and reviewed through a series of quality checks.

Although 200 charts were requested for the target sample, a total of 89 charts were obtained from provider offices and health care facilities. These charts were reviewed for the presence of denominator exclusions that were not present in claims. There were 33 children (37.1%) with documentation of a condition that met denominator exclusion within the chart, resulting in a total of 56 children (62.9%) who met denominator criteria for this measure. Among patients eligible for the denominator, CT imaging was obtained without a documented indication for 44 children (78.6%).

Inter-Rater Reliability (IRR). Reliability of medical record data was determined through re-abstraction of patient record data to calculate the IRR between abstractors. Broadly, IRR is the extent to which the abstracted information is collected in a consistent manner. Low IRR may be a sign of poorly executed abstraction procedures, such as ambiguous wording in the data collection tool, inadequate abstractor training, or abstractor fatigue. For this measure, the medical record data collected by three abstractors was individually compared with the data obtained by a senior abstractor. IRR was determined by calculating both percent agreement and Cohen's kappa statistic.

Of the 89 medical records received for chart review, 13 records (14.6%) were reviewed for IRR. IRR was assessed by comparing the abstractor agreement with a senior abstractor on 16 questions included in the chart abstraction form for this measure. Overall, abstractor agreement was 100%; the kappa statistic was 1.0, indicating a perfect level of agreement was achieved. Given this evidence, the data elements needed for calculation of the measure can be abstracted from medical records with a high degree of accuracy.

Validity
The face validity of this measure was established by a national panel of experts and parent representatives for families of children with headaches or seizures convened by Q-METRIC. The Q-METRIC panel included nationally recognized experts in the area of imaging children, representing general pediatrics, pediatric radiology, pediatric neurology, pediatric neurosurgery, pediatric emergency medicine, general emergency medicine, and family medicine. In addition, face validity of this measure was considered by experts in state Medicaid program operations, health plan quality measurement, health informatics, and health care quality measurement. In total, the Q-METRIC imaging panel included 15 experts, providing a comprehensive perspective on imaging children and the measurement of quality metrics for states and health plans.

The Q-METRIC expert panel concluded that this measure has a high degree of face validity through a detailed review of concepts and metrics considered to be essential to the appropriate imaging of children. Concepts and draft measures were rated by this group for their relative importance. This measure received an average score of 7.6 (with 9 as the highest possible score).

Refer to the original measure documentation for additional information.

Evidence for Extent of Measure Testing

Quality Measurement, Evaluation, Testing, Review and Implementation Consortium (Q-METRIC). Basic measure information: overuse of computed tomography scans for the evaluation of children with a first generalized afebrile, atraumatic seizure. Ann Arbor (MI): Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium (Q-METRIC); 2016 Jan. 66 p.

State of Use of the Measure

State of Use

Current routine use

Current Use

not defined yet

Application of the Measure in its Current Use

Measurement Setting

Ambulatory/Office-based Care

Ambulatory Procedure/Imaging Center

Emergency Department

Hospital Outpatient

Managed Care Plans

Professionals Involved in Delivery of Health Services

not defined yet

Least Aggregated Level of Services Delivery Addressed

Single Health Care Delivery or Public Health Organizations

Statement of Acceptable Minimum Sample Size

Specified

Target Population Age

Age 1 to 17 years

Target Population Gender

Either male or female

National Strategy for Quality Improvement in Health Care

National Quality Strategy Aim

Better Care

National Quality Strategy Priority

Making Care Safer
Prevention and Treatment of Leading Causes of Mortality

Institute of Medicine (IOM) National Health Care Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Safety

Data Collection for the Measure

Case Finding Period

The measurement year

Denominator Sampling Frame

Enrollees or beneficiaries

Denominator (Index) Event or Characteristic

Clinical Condition

Diagnostic Evaluation

Patient/Individual (Consumer) Characteristic

Denominator Time Window

not defined yet

Denominator Inclusions/Exclusions

Inclusions
The denominator is the number of children, ages 1 through 17 years old, for whom computed tomography (CT) imaging of the head is obtained for the evaluation of a first generalized afebrile, atraumatic seizure.

Note:

Eligible children must be ages 1 through 17 years old during the measurement year during which CT imaging of the head is obtained and must be continuously enrolled in their insurance plan during both the measurement year and the year prior.
Seizure must occur on the day of or up to 30 days prior to imaging. Table 1 of the original measure documentation lists Current

Procedural Terminology (CPT) codes associated with CT imaging of the head. International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes to identify afebrile, atraumatic seizure are shown in Table 2 of the original measure documentation. Afebrile, atraumatic seizures are those not associated, respectively, with fever or with trauma occurring in the 7 days prior to imaging.

Exclusions

Exclusions based on ICD-9-CM codes captured in administrative claims data:

- Partial seizure (refer to Table 2 of the original measure documentation) on the day of or within the 365 days before imaging was obtained
- Fever (by ICD-9 codes 780.6x) on the day of or day before imaging was obtained
- Complex febrile seizure (refer to Table 2 of the original measure documentation) on the day of or within the 365 days before the first generalized afebrile, atraumatic seizure in the measurement year
- Post-traumatic seizure (refer to Table 2 of the original measure documentation) on the day of or day before imaging was obtained
- Suspected abuse and neglect or other head trauma (refer to Table 3 of the original measure documentation or the presence of an E-code in claims data) on the day of or within 7 days before imaging was obtained
- ICD-9 codes 783.40 (lack of expected normal physiological development) or 783.42 (delayed milestones) on the day of or within the 365 days before the first generalized afebrile, atraumatic seizure in the measurement year
- Other pre-existing conditions that would warrant imaging (refer to Tables 4-7 of the original measure documentation) on the day of or within 365 days before imaging was obtained
- Infections that would warrant imaging on the day of or within the 365 days before the atraumatic seizure (refer to Table 8 of the original measure documentation)
- Lumbar puncture (refer to Table 9 of the original measure documentation) on the day of or day after imaging was obtained
- Imaging study obtained on the day of or within the 180 days following neurosurgical intervention (refer to Table 9 of the original measure documentation)

Exclusions based on clinical documentation:

- Partial seizure
- Fever
- Complex febrile seizure
- Post-traumatic seizure
- Trauma such as skull fracture, concussion, intracranial hemorrhage and suspected abuse
- Developmental delay, lack of expected normal physiological development or delayed milestone
- Pre-existing conditions that would warrant imaging such as neoplasm and blood disorder, hydrocephalus and central nervous system (CNS) anomalies, hemangioma, phlebitis/thrombophlebitis, occlusion of cerebral arteries, moyamoya disease, tumor, hemorrhage, or tuberous sclerosis
- Infection such as meningitis, brain abscess, HIV, and encephalitis
- Lumbar puncture
- Imaging as part of surgical evaluation for seizure management (pre-operative or post-operative) on the day of or within the 30 days prior to the generalized afebrile, atraumatic seizure
- Neurological surgery

Exclusions/Exceptions

not defined yet

Numerator Inclusions/Exclusions

Inclusions

The numerator is the number of children, ages 1 through 17 years old, for whom computed tomography

(CT) imaging of the head is obtained for the evaluation of a first generalized afebrile, atraumatic seizure without indication for CT imaging.

Exclusions
Exclusions based on clinical documentation:

- Status epilepticus
- Neurologic signs of increased intracranial pressure
- Notably different mental state when compared with the child's own prior exams
- An abnormal neurologic exam between the time of diagnosis and the time of imaging

Numerator Search Strategy

Fixed time period or point in time

Data Source

Administrative clinical data

Electronic health/medical record

Paper medical record

Type of Health State

Does not apply to this measure

Instruments Used and/or Associated with the Measure

Unspecified

Computation of the Measure

Measure Specifies Disaggregation

Does not apply to this measure

Scoring

Rate/Proportion

Interpretation of Score

Desired value is a lower score

Allowance for Patient or Population Factors

not defined yet

Standard of Comparison

not defined yet

Identifying Information

Original Title

Overuse of computed tomography scans for the evaluation of children with a first generalized afebrile, atraumatic seizure.

Measure Collection Name

Overuse of Imaging for the Evaluation of Children with Headache or Seizures

Submitter

Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium (Q-METRIC) - Academic Affiliated Research Institute

Developer

Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium (Q-METRIC) - Academic Affiliated Research Institute

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Composition of the Group that Developed the Measure

Overuse of Imaging Expert Panels

Representative Panel

Dana Cook, Parent Representative, Paw Paw, MI
Peter Dayan, MD, MSc, Division of Pediatric Emergency Medicine, Morgan Stanley Children's Hospital, New York, NY
Lisa Dover, Parent Representative, Ann Arbor, MI
Danny Greig, MD, FAAFP, Emergency Room Physician, MidMichigan Medical Center, Midland, MI
Blaise Jones, MD, Director of Clinical Services, Chief of Neuroradiology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH
Steven Leber, MD, PhD, Professor of Pediatrics and Neurology, University of Michigan, Ann Arbor, MI
Cormac Maher, MD, Associate Professor of Neurosurgery, University of Michigan, Ann Arbor, MI
L. Kendall Webb, MD, Assistant Professor of Emergency Medicine, Director of IT for the Emergency Department, University of Florida, Jacksonville, Jacksonville, FL
Neal Weinberg, MD, FAAP, General Pediatrician, IHA Pediatric Healthcare – Arbor Park, Ann Arbor, MI

Feasibility Panel

Cathy Call, RN, BSN, MSEd, MSN, CPHQ, PMP, LSS, Practice Area Leader for Health Quality Research, Health Care Analytics Group, Altarum Institute, Alexandria, VA
Andrea DeVries, PhD, Director of Research Operations, HealthCore Inc., Wilmington, DE
J. Mitchell Harris, PhD, Director of Research and Statistics, Children's Hospital Association, (formerly NACHRI), Alexandria, VA
Don Lighter, MD, MBA, Director, The Institute for Health Quality Research and Education, Knoxville, TN
Sue Moran, BSN, MPH, Director of the Bureau of Medicaid Program Operations and Quality Assurance, Michigan Department of Community Health, Lansing, MI
Stuart Weinberg, MD, Assistant Professor of Biomedical Informatics, Assistant Professor of Pediatrics, Vanderbilt University, Nashville, TN

Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium (Q-METRIC) Investigators

Michelle L. Macy, MD, MS, Assistant Professor, Departments of Emergency Medicine and Pediatrics, School of Medicine, University of Michigan, Ann Arbor, MI
Gary L. Freed, MD, MPH, Professor of Pediatrics, School of Medicine and Professor of Health Management and Policy, School of Public Health, University of Michigan, Ann Arbor, MI (principal investigator)
Kevin J. Dombkowski, DrPH, MS, Research Associate Professor of Pediatrics, School of Medicine, University of Michigan, Ann Arbor, MI

Financial Disclosures/Other Potential Conflicts of Interest

Unspecified

Adaptation

This measure was not adapted from another source.

Date of Most Current Version in NQMC

2016 Jan

Measure Maintenance

Unspecified

Date of Next Anticipated Revision

Unspecified

Measure Status

This is the current release of the measure.

Measure Availability

Source available from the Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium (Q-METRIC) Web site . Support documents also available from the Q-

METRIC Web site .

For more information, contact Q-METRIC at 300 North Ingalls Street, Room 6C08, SPC 5456, Ann Arbor, MI 48109-5456; Phone: 734-232-0657.

NQMC Status

This NQMC summary was completed by ECRI Institute on May 9, 2016. The information was verified by the measure developer on June 29, 2016.

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Production

Source(s)

Quality Measurement, Evaluation, Testing, Review and Implementation Consortium (Q-METRIC). Basic measure information: overuse of computed tomography scans for the evaluation of children with a first generalized afebrile, atraumatic seizure. Ann Arbor (MI): Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium (Q-METRIC); 2016 Jan. 66 p.

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